5-Bay Raid Sub-System

Smart Removable 3.5" SATA Multiple Bay Data Storage Device

User's Manual

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1. How the SteelVine (VPMP-75511R/VPMA-75511R) operates

The VPMP-75511R / VPMA-75511R supports configuration and management of multiple storage devices connected to a single host. Its built-in features include RAID configuration, and virtualization capabilities.

1-1 Storage policies

JBOD: A storage policy that grants the host computer direct access to a physical disk drive. With **JBOD** (just a bunch of disks), the number of available virtual drives is equal to the number of physical drives. **JBOD** is also called the bypass mode because the host bypasses the SteelVine virtualization engine to access the drive directly.

SAFE: A storage policy in which all data are stored in duplicate on separate hard disk drives to protect against data loss due to drive failure. At least two hard disk drives mirror each other at all times, equivalent to RAID 1. Every write operation goes to both drives. **SAFE** provides the highest level of data protection, but halves the amount of storage space because all data must be stored twice.

To implement the **SAFE** storage policy, the Basic Configuration Wizard creates two volumes. Each volume consists of two hard disk drives that mirror each other.

BIG: A storage policy configuration in which multiple physical hard disk drives are concatenated and treated as one large volume. This configuration allows the end-user to increase logical volume size beyond the capacity of individual hard disk drives. **BIG** provides the maximum amount of storage space, but no additional performance or data redundancy.

The Basic Configuration Wizard implements the **BIG** storage policy by concatenating all the hard disk drives into a single volume.

FAST: A storage policy in which I/O processing is balanced evenly in a method known as striping, equivalent to RAID 0. Striping increases storage operation speed as each portion of data is divided into segments that are written to different disks sim ultaneously. **FAST** offers the best performance in terms of speed, but has no redundancy of data.

1-2 Prerequisites

The VPMP-75511R/ VPMA-75511R installation has the following hardware and software prerequisites for the host computer(s)

Hardware

- For x86 platforms: An Intel PIII 500MHz equivalent or faster
- For Mac platforms: A Mac G4 500MHz or faster
- CD-ROM drive
- 64 MB of RAM minimum
- 250 MB of free hard disk space
- Super VGA (800 x 600) or higher resolution with 256 colors
- Mouse or compatible pointing device
- External SATA cable connection between the VPMP-75511R/ VPMA-75511R Storage Appliance and the host computer

Software

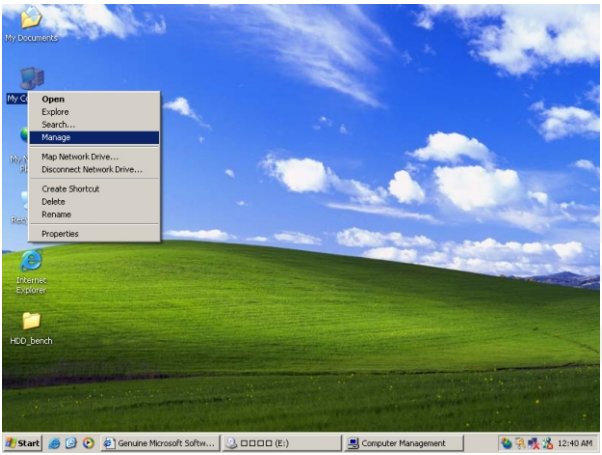
- Microsoft Windows 2000, Windows XP, or Windows Server 2003 with the latest Service Pack installed.
  For Mac platforms: Mac OS X with the latest set of patches installed.

Install the driver

1. Insert the CD into the CD-ROM drive.
2. Click the **Setup** icon in the Windows or Mac directory and follow the Installation Wizard to complete the installation.

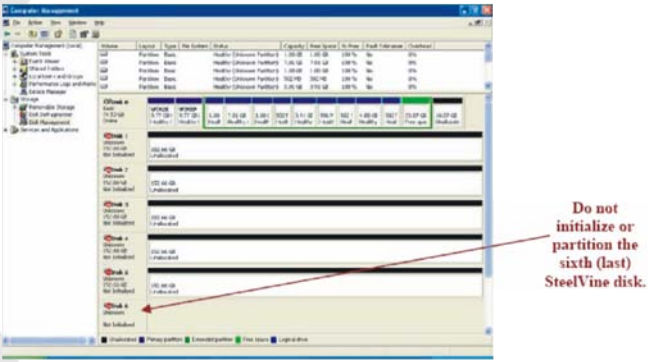
2. Getting Started
Start the SteelVine Manager
2-1 Connect the Host to the VPMP-75511R / VPMA-75511R
MS Windows

1. Plug the VPMP-75511R / VPMA-75511R Storage Appliance into an AC power outlet and turn the VPMP-75511R / VPMA-75511R power switch to ON.
2. Attach the VPMP-75511R / VPMA-75511R Storage Appliance to the host computer with an external SATA cable.
3. Right-click the **My Computer** icon on your desktop and select **Manage** from the pop-up menu.



4. Click **Disk Management** under **Storage** to view the disk drives.
5. If an **Initialize and Convert Disk Wizard** dialog appears, click **Cancel** to close the Wizard and proceed to **Disk Management**.

6. Verify that all two drives are visible in their preconfigured and unallocated state.



2-2 Start the VPMP-75511R

The SteelVine Manager starts with the Status window visible so you can monitor the SteelVine Storage Appliances. The status only mode is entered when the Rotary switch is in the JBOD, BIG, FAST or SAFE mode. In Status only mode, the user is not allowed to change the configuration from the GUI. The only possible way to change the configuration is to change the Switch setting to in JBOD, Big, Fast or Safe mode.

MS Windows

1. Select the **Start** > **All Programs** > **SteelVine** > **SteelVine Manager** icon to start the Manager.

2. Monitor the status of SteelVine Storage Appliances on the Status window.

3. Select menu options or click toolbar buttons and follow the instructions in the remainder of this guide to configure SteelVine Storage Appliances. When prompted, enter the administrative password. The default password is **admin**.

Table 1: Toolbar buttons on the Status Windows.

Button	Tooltip	Description
	Configure Box	Opens the Basic Configuration Wizard. From there, the end-user can access the Advanced Configuration Wizard.
	Specify Policy Information	Opens the Rebuild Policy dialog.
	Email Notification	Sends email notification for the selected items.
	Show Event Log	Opens the Event Log viewer.
	Specify Firmware	Opens the Firmware Selection dialog.

Table 2: A look at the SteelVine Status Window

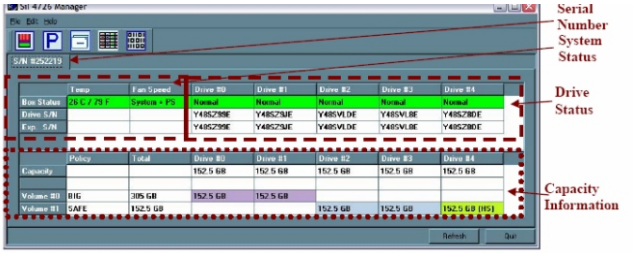


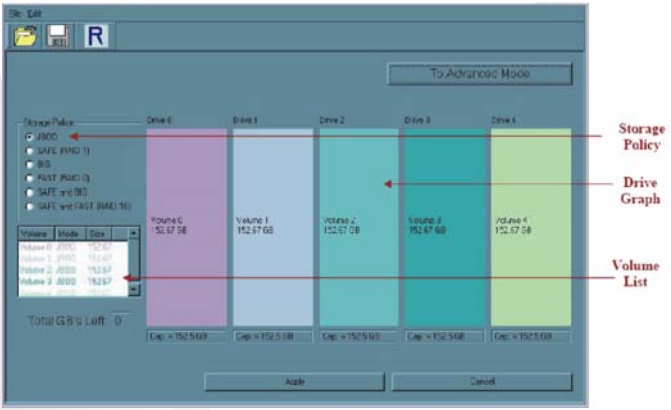
Table 3: Sections of the Status Window

Status Cells	Description
System Status section	
Temp	Indicates the current **temperature** of the SteelVine Storage Appliance.
Fan Speed	Indicates the system **fan status**. Use this data to monitor possible malfunctions.
Drive Status section	
Box Status	Shows the **drive status**: Normal, Rebuilding, Unplugged, Needs Rebuild, New Drive, Wrong Slot.
Drive S/N	Shows the unique serial number assigned by the disk manufacturer.
Exp. S/N	Shows the expected serial number of the hard disk drive. The **daemon** compares the Expected and actual Drive serial numbers to detect when a drive's status changes.
Capacity Information section	
Policy	Shows the **storage policy** configured for each volume.
Total	Shows the combined capacity of the volume.
Drive #	Shows capacity information for each hard disk drive.
Capacity	Shows the full amount of storage space (in GB) available on each hard disk drive.
Volume	Shows the total volume capacity and the drive capacities assigned to each volume.

3. Basic Configuration

3-1 A Look at the Basic Configuration Wizard

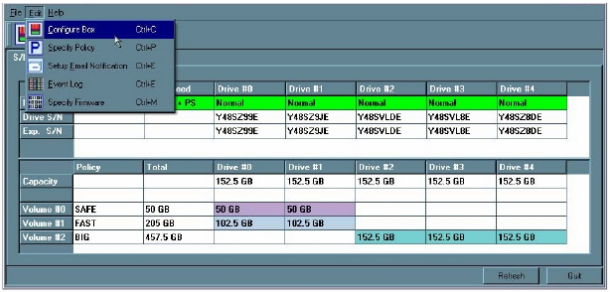
The SteelVine Basic Configuration Wizard is accessible from the Status window and allows volume management. The Basic Configuration Wizard defines volumes based on a selected storage policy. An end-user cannot modify volume counts or capacities. To protect against unintended changes, the SteelVine Manager prompts for a password for first time access of the Wizard. The default password is **admin**.
(See "**Change Password**" for additional information on password management.)



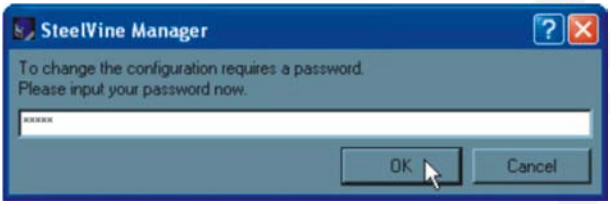
3-2 Configure Volumes

Note: Use the Disk Management utility provided by the OS to delete all VPMP-75511R/ VPMA-75511R partitions except the un-allocated, un-initialized disk that represents the SteelVine processor. See "Partitioning volumes" for details.

1. Select **Configure Box** from the Edit menu or click the **Configure Box** toolbar button to open the Configuration Wizard.

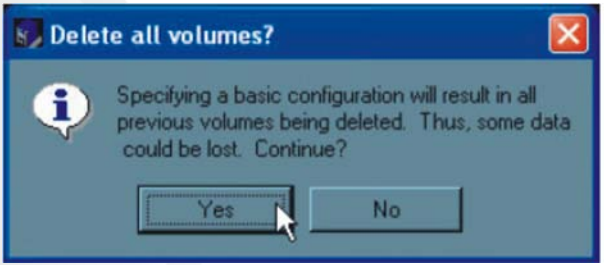


2. When prompted, enter the administrator password. The default password is **admin**.



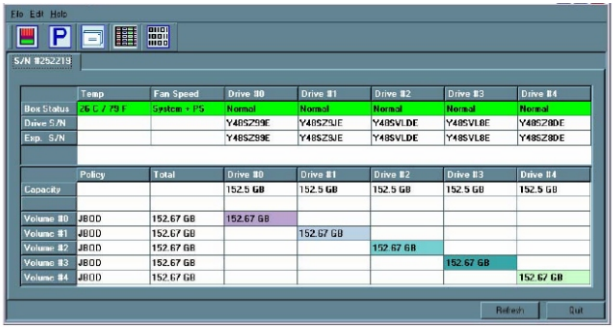
3. Select a storage policy in the **Storage Policy** frame.

4. When prompted to acknowledge that the configuration change may result in data loss, click **Yes** to accept the configuration.


Delete all volumes?
Specifying a basic configuration will result in all previous volumes being deleted. Thus, some data could be lost. Continue?
Yes
No

5. Select **Save to Config File** from the File menu or click the **Write configuration for system to a file** toolbar button to save the configuration.

6. Click **Apply** to create the selected configuration. The Volume display will close automatically and the Status window will refresh (within a minute or so).



7. Partition the configured volume(s) to complete the implementation. See "Partitioning Volumes" for details.

4. Advanced Configuration

4-1 Why Advanced Configuration?

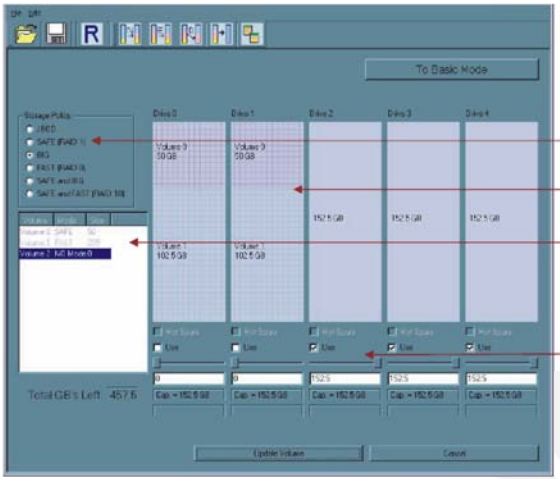
The Basic Configuration Wizard provides six predefined storage policies to quickly configure the VPMP-75511R / VPMA-75511R Storage Appliance. Each predefined storage policy allocates the maximum system capacity to the selected storage policy. Using the Advanced Configuration Wizard, you can configure up to ten volumes - each with different storage policies and capacities. This flexibility provides numerous combinations of performance, redundancy, and capacity to meet your business requirements. For example:

- For applications that produce critical data, redundancy is important. You could use the Basic Configuration Wizard to implement the predefined **SAFE**, **SAFE and FAST**, or **SAFE and BIG** storage policy. This format would allocate all hard disk drives to **SAFE** volumes. This may be excessive for your needs. Use the Advanced Configuration Wizard to create additional volumes and allocate capacity more efficiently.
- For applications that require hundreds of gigabytes of storage space, the added redundancy of a SAFE configuration's Hot Spare may not be an acceptable luxury. Use the Advanced Configuration Wizard to create multiple volumes that make use of every gigabyte of available space.

These are just a few of the possible combinations of storage policy and capacity allocations that you can create with the Advanced Configuration Wizard. Experiment with other combinations to allocate the total system capacity to meet your needs.

4-2 A Look at the Advanced Configuration Wizard

The Advanced Configuration Wizard is an extension of Basic mode that allows you to create two volumes (virtual drives) on each physical hard disk drive.



Toolbar Buttons on the Advanced Configuration Wizard

Button	Tooltip	Description
	Read a configuration from a file	Reads a saved configuration into the Advanced Configuration Wizard so you can apply the configuration to the SteelVine Storage Appliance. Available in Basic and Advanced modes.
	Write configuration for system to a file	Saves a configuration to a file on the host computer. Available in Basic and Advanced modes.
	Restore configuration to last Commit	Cancels proposed changes. Available in Basic and Advanced modes.
	Create a new volume	Creates a new volume on which to set the storage policy and capacity. You can create up to 2 volumes on each hard disk drive (10 total).
	Edit selected volume	Permits the storage policy and capacity of an existing volume to be modified.
	Delete selected volume	Deletes the volume that is currently selected in the volume list.
	Delete all volumes	Deletes all configured volumes.
	Copy configuration from other device in the system	Copies the configuration of one SteelVine Storage Appliance to the current SteelVine Storage Appliance.

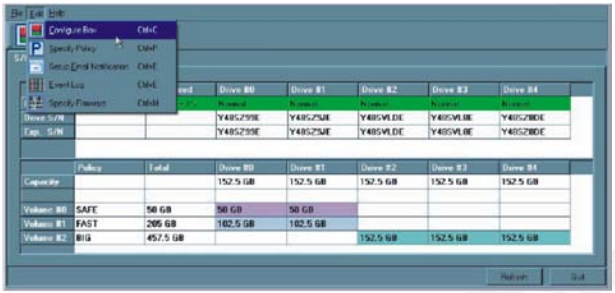
4-3 Configure Multiple Volumes

The Advanced Configuration Wizard allows many combinations of storage policies and capacities. This procedure shows how to modify a basic **SAFE** configuration so that it contains several volumes, each with different storages policies. This example illustrates one possible combination that allocates all of the system's available capacity to:

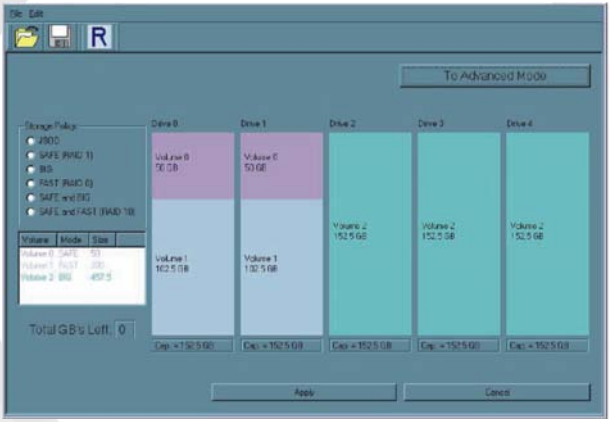
- One 50-gigabyte (GB) SAFE volume on drives 0 and 1, with no reserved for a Hot Spare.
- One Fast volume that uses the remaining capacity on drive 0 and 1.
- One Big volume that uses all of the capacity on drives 2, 3, and 4.

The same sequence of steps applies to any configuration you choose to implement; only the storage policy and capacity allocation vary for different configuration options.

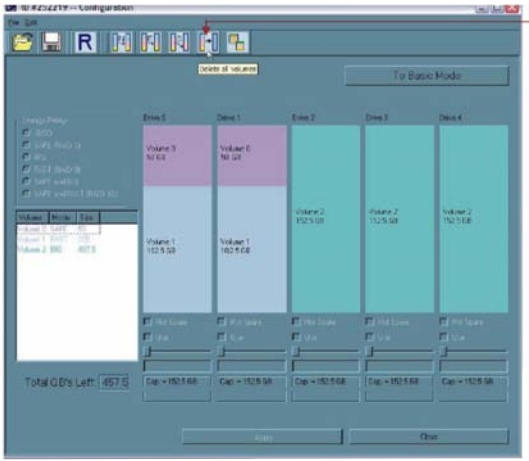
1. Select **Configure Box** from the Edit menu or click the **Configure Box** toolbar button to open the Basic Configuration Wizard.



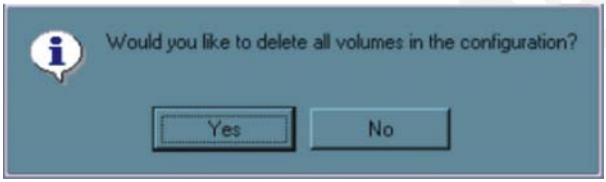
2. Click **To Advanced Mode** to open the Advanced Configuration Wizard.



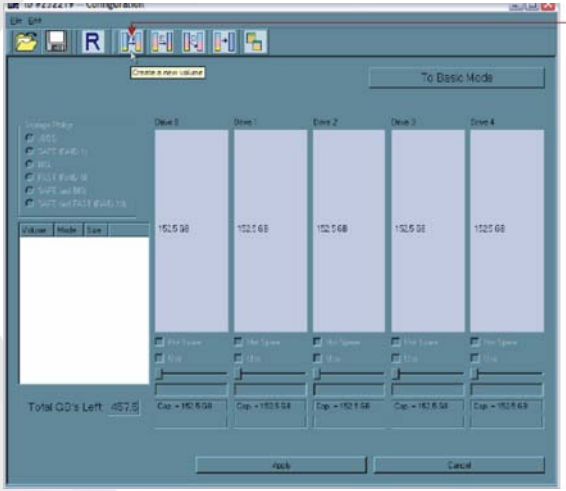
3. Select the "**Delete all volumes**" from the toolbar



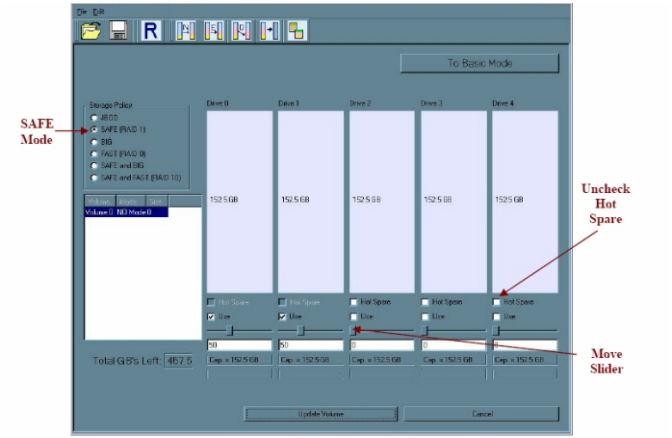
4. When prompted to confirm the deletion of the volumes, click **Yes**.



5. Select "**Create a new volume**" from the toolbar.



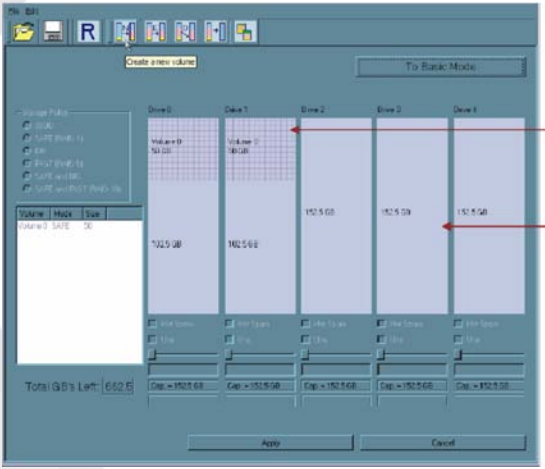
6. Select SAFE (RAID 1) as the Storage Policy. Click on the "**Use**" check boxes underneath Drives 0 and 1. Move the slide to 50.



7. Click **Update Volume**.

8. When prompted whether to create a Hot Spare for the SAFE volume, click **NO**.

9. Click the "**Create a New Volume**" toolbar button.



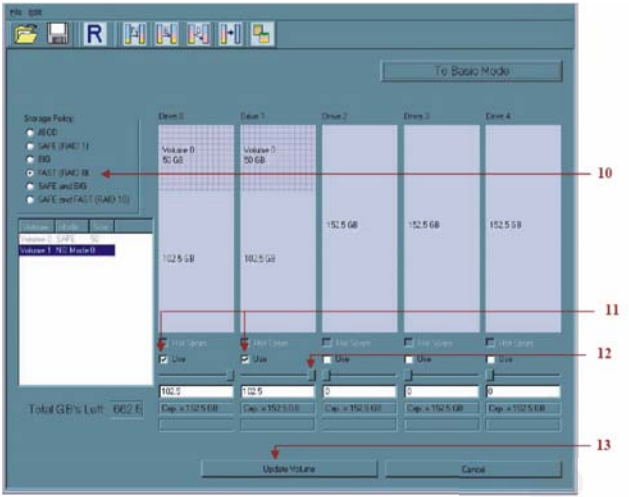
10. Select the **FAST** radio button in the Storage Policy section.

11. Select the "**Use**" check box beneath both Drive 0 and Drive 1. This example illustrates two-drive stripping.

12. Move the slider beneath Drive 0 all the way to the right to allocate the remaining capacity on the two drives to the Fast volume.

If you wish, you can allocate less than the total remaining capacity to the new volume. However, doing so makes the unallocated capacity unavailable and unused.

13. Click "**Update Volume**"

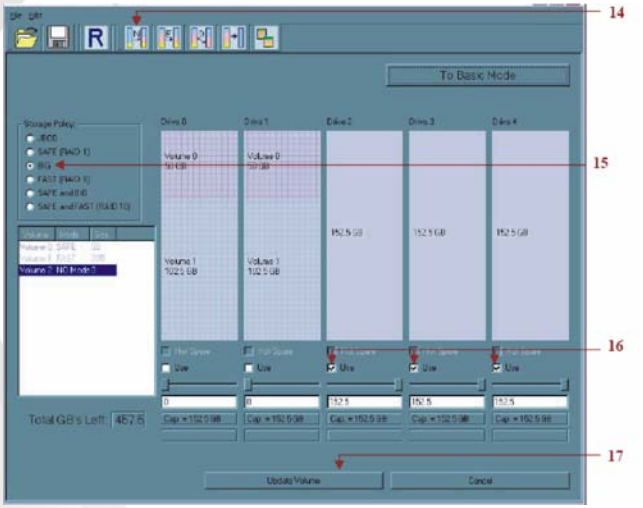


14. Click the "**Create a New Volume**" toolbar button.

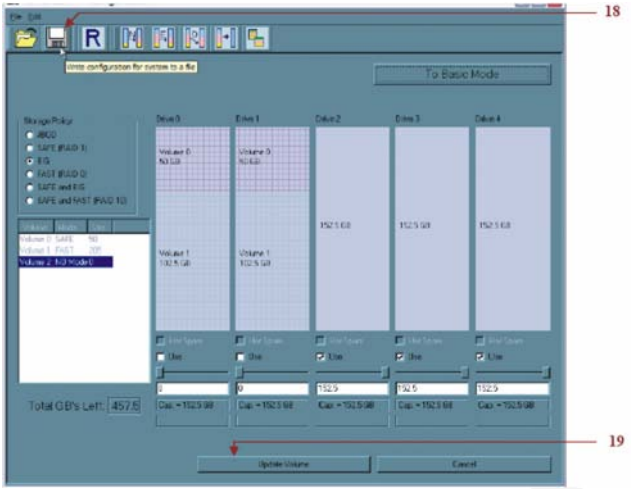
15. Select the **BIG** radio button in the Storage Policy section.

16. Select the "**Use**' check box beneath Drive 2, Drive 3, and Drive 4 to allocate all of the remaining system capacity to the **BIG** volume.

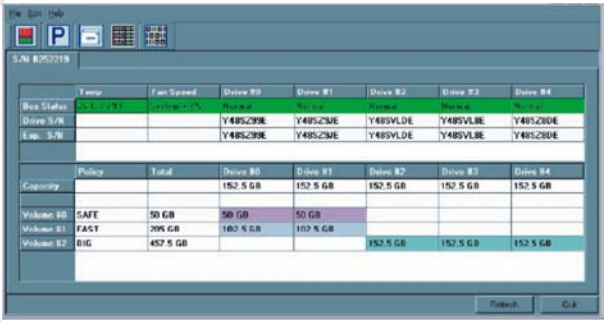
17. Click **Update Volume**.



18. Click **Update Volume**.



19. Click **Update Volume** to create the multi-volume, close the Wizard, and display the volumes in the Status window (within a minute or so)



20. Partition the configured volumes to complete the implementation.
See Partitioning Volumes for details.

5. Manage Configuration Files

The Basic Configuration Wizard provides menus and icons to manage configuration files.

- The **Read Config File** command from the File menu in the Basic Configuration Wizard imports a configuration file so that the end-user can restore a previously saved configuration (storage policy).
- The **Save to Config File** command from the File menu in the Basic Configuration Wizard exports an SteelVine configuration to a file. Each of the procedures in the "Basic Configuration" chapter prompts you to save a configuration file.

5-1 Import a configuration file

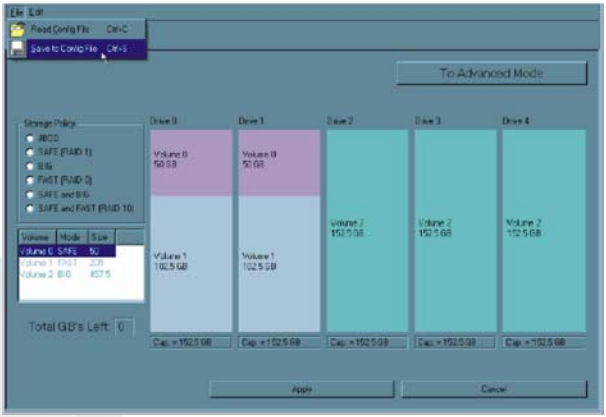
Note: The end-user must have previously saved a configuration file so that one is available to import it. See "Save a configuration file" for details.

1. Select **Configure Box** from the Edit menu or click the **Configure Box** toolbar button in the Status window to open the Basic Configuration Wizard.
2. Select **Read Config File** from the File menu in the Basic Configuration Wizard.

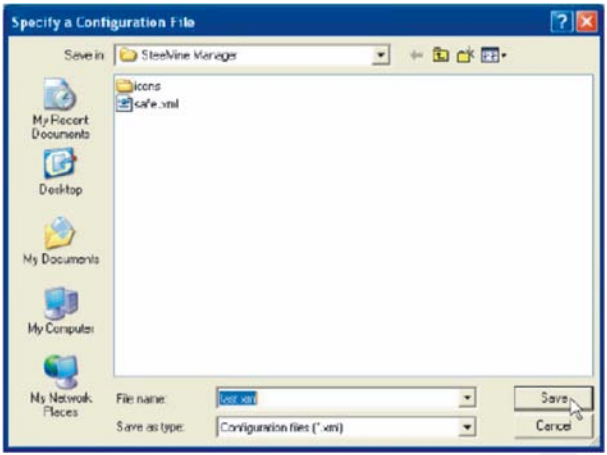
3. Navigate to the required file and click **Open** to import it. The Basic Configuration Wizard provides notice of a successful import and graphically displays the imported volumes.
4. Click **OK** to implement the imported configuration.

5-2 Save a Configuration File

1. Select **Configure Box** from the Edit menu or click the **Configure Box** toolbar button in the Status window to open the Basic Configuration Wizard.
2. Select **Save to Config File** from the File menu in the Basic Configuration Wizard.



3. Navigate to the appropriate directory, specify a file name in the **File Name** text box, and click the **Save** button.



6. Partitioning Configured Volumes

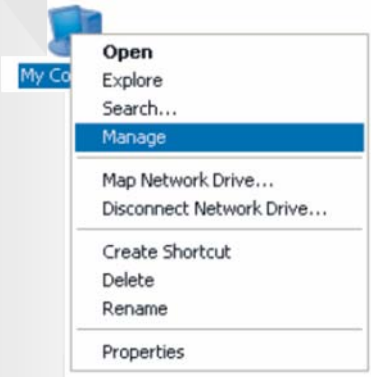
This chapter explains how to partition volumes after configuring them with the SteelVine Manager. The end-user must partition volumes for the host computer's operating system before one can store data on the volumes. Refer to the operating system documentation for further guidance.

6-1 Partition a Volume

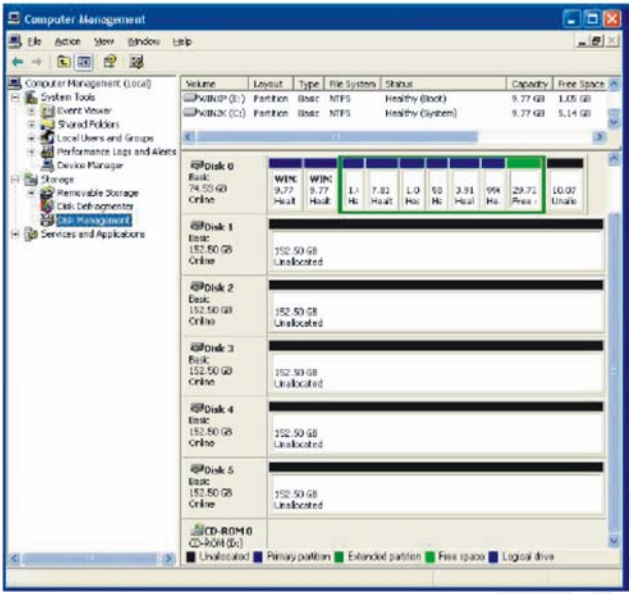
MS Windows

Important: Before reconfiguring a volume, back up the data and delete previously defined SteelVine partitions. Do not, however, delete the partition that represents the SteelVine processor (the "Not Initialized" disk with no capacity allocated to it). After the end-user configures and partitions the new volumes, S/he can restore the backed-up data to the new configuration.

1. Right-click the **My Computer** icon and select **Manage** from the pop-up window.

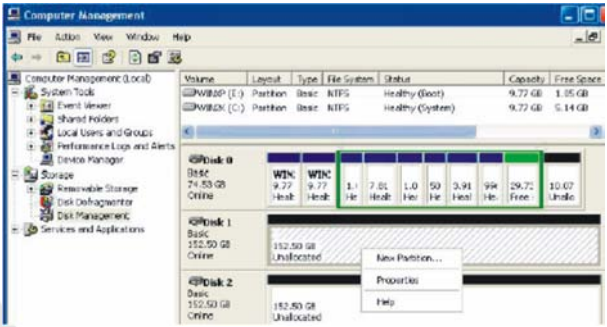


2. From the Computer Management window select **Disk Management** under **Storage** to open Windows Disk Manager.

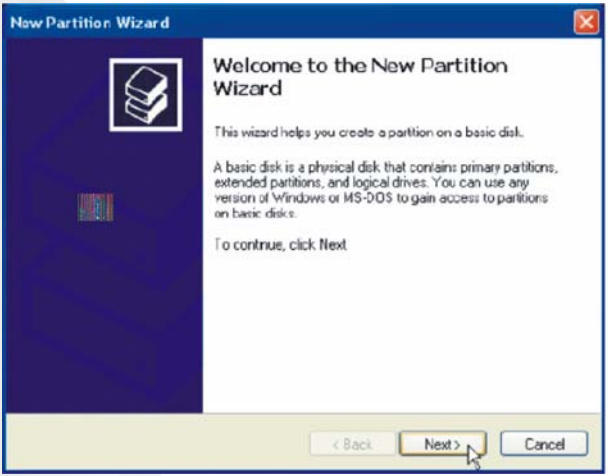


Note: The Disk numbers in the Windows Disk Manager may be different from the Volume numbers shown in the VPMP-75511R/ VPMA-75511R Status window, the Basic Configuration Wizard, and the Advanced Configuration Wizard. Be sure to select the correct disk based on the expected disk capacity to create a partition.

3. Right-click on the configured disk's unallocated space and select **New Partition**. If the New Partition option is not available, select the disk and Initialize it first. To do this, right-click on the disk item and select "Initialize Disk".



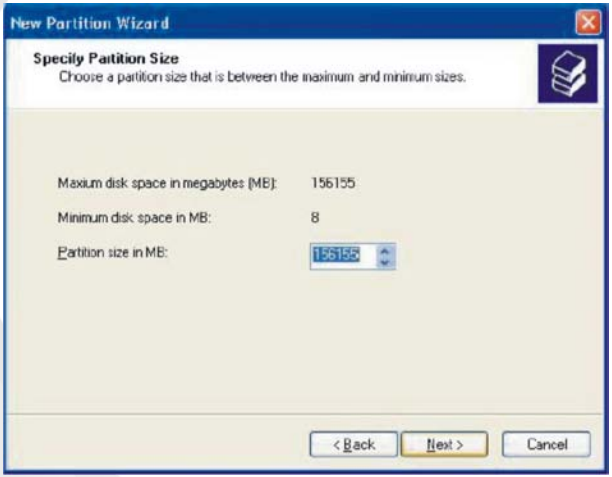
4. Click **Next** to start the Partition Wizard.


New Partition Wizard
Welcome to the New Partition Wizard
This wizard helps you create a partition on a basic disk.
A basic disk is a physical disk that contains primary partitions, extended partitions, and logical drives. You can use any version of Windows or MS-DOS to gain access to partitions on basic disks.
To continue, click Next
< Back
Next >
Cancel

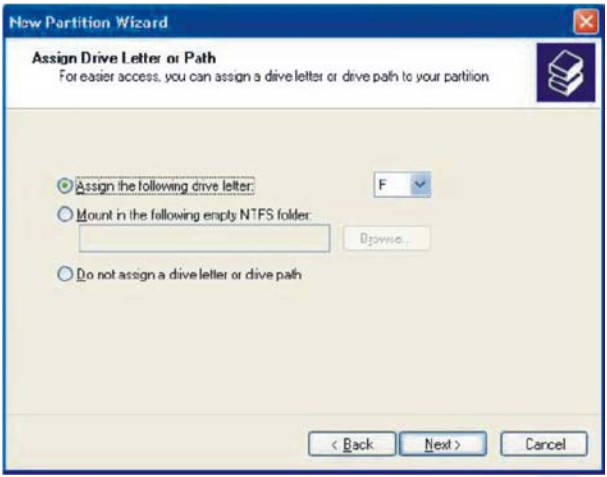
5. Select the Primary or Extended option and click **Next**.

New Partition Wizard
Select Partition Type
There are three types of partitions: primary, extended, and logical.
Select the partition you want to create:
Primary partition
Extended partition
Logical drive
Description
A primary partition is a volume you create using free space on a basic disk. Windows and other operating systems can start from a primary partition. You can create up to four primary partitons or three primary partitions and an extended partition.
< Back
Next >
Cancel

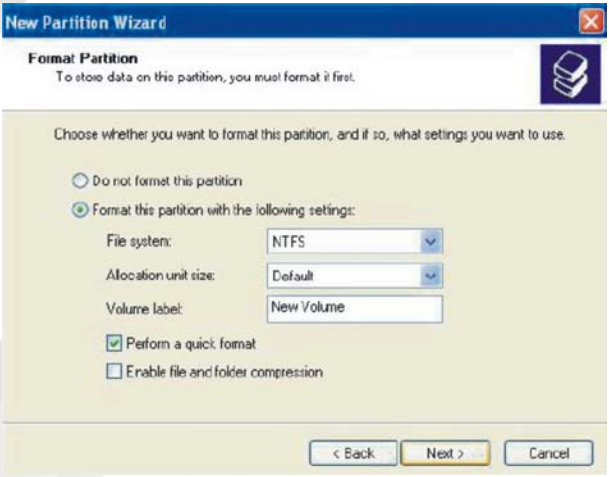
6. Specify the partition size. By default, the partition occupies the entire volume. Click **Next**.


New Partition Wizard
Specify Partition Size
Choose a partition size that is between the maximum and minimum sizes.
Maxium disk space in megabytes (MB): 156155
Minimum disk space in MB: 8
Partition size in MB: 156155
< Back
Next >
Cancel

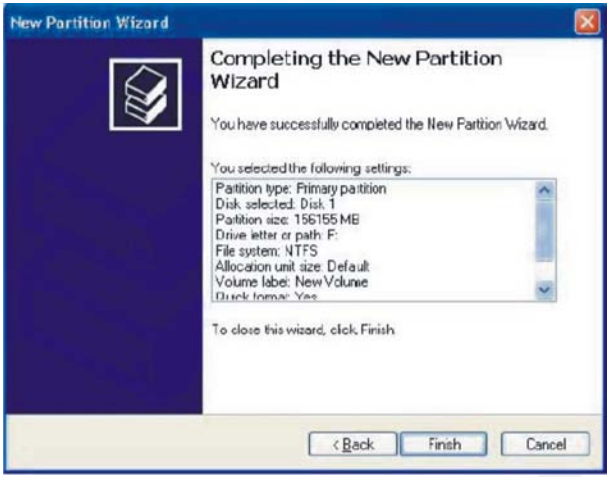
7. Assign a drive letter or mount path and click **Next**.


New Partition Wizard
Assign Drive Letter or Path
For easier access, you can assign a drive letter or drive path to your partition.
Assign the following drive letter:
F
Mount in the following empty NTFS folder:
Browse...
Do not assign a drive letter or drive path
< Back
Next >
Cancel

8. Select file system and name the partition and click **Next**.


New Partition Wizard
Format Partition
To store data on this partition, you must format it first.
Choose whether you want to format this partition, and if so, what settings you want to use.
Do not format this partition
Format this partition with the following settings:
File system:
NTFS
Allocation unit size:
Default
Volume label:
New Volume
Perform a quick format
Enable file and folder compression
< Back
Next >
Cancel

9. Review the file system settings and click **Finish** to create the logical partition.



10. Repeat steps 1 through 9 to partition any remaining disks you configured in the SteelVine Manager. Remember, do not partition the disk that represents the SteelVine processor.

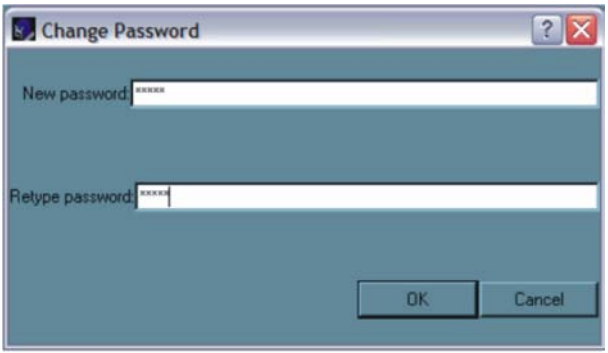
7. Change Password

The VPMP-75511R/ VPMA-75511R limits configuration access with a password prompt. The password information is stored locally on the server running the daemon. The default password is admin.

1. Select Change Password from the File menu

2. Enter the current password (or use "dmin" if the default password has not been changed)

3. Enter the new password of 5 or more characters in both fields.



4. Click OK to implement the new password

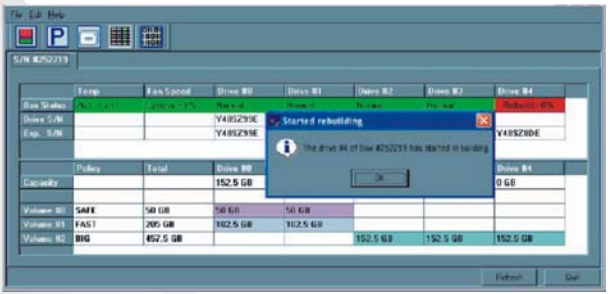
8. Rebuild

8-1 When is a rebuild necessary?

A rebuild is initiated to restore data redundancy for a SAFE volume that has entered a vulnerable state. In a vulnerable state, one of the two mirrored disks goes offline or is inaccessible. Although the SAFE volume remains available during the rebuild process, the volume is susceptible to data loss through damage of the remaining disk until data redundancy is restored through a rebuild. Hose access takes precedence over the rebuild process. If continuing to use the SAFE volume during the rebuild, the rebuild process will take a longer time to complete.

8-2 What happens during a rebuild?

The rebuild process restores data redundancy by first utilizing space allocated for a Hot Spare. In case Hot Space does not exist or has already been rebuilt, the SteelVine processor rebuilds to empty space on a hard disk other than one containing vulnerable data. Following a rebuild, it is not necessary to designate space to a Hot Spare for a subsequent rebuild to occur.



In this example, the daemon started a rebuild of Volume#1 after a failure of Disk#3. Once the end-user replaces Disk#3 with a new hard disk drive, the SteelVine processor will initiate a rebuild to Drive#3.

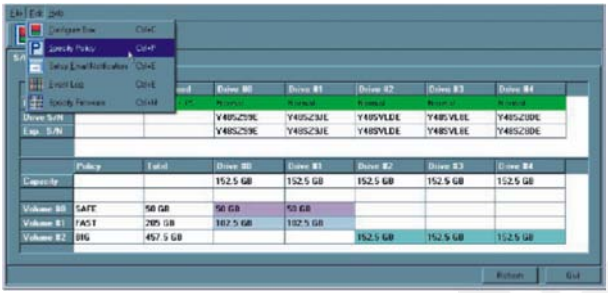
Note: Once the daemon rebuilds to a designated Hot Spare, a designated Hot Spare will not exist and the SteelVine processor will rebuild to empty space.

With **Automatic Rebuild and Immediate Rebuild** options selected, the daemon automatically initiates an immediate rebuild. If the end-user wants the daemon to delay the rebuild until after the first write to the **SAFE** volume, select the **Rebuild Only If Needed** option. The latter setup allows temporary removal of a hard disk drive without requiring a rebuild. To minimize the possibility of data loss, the rebuild process should be set up to start immediately.

With **Manual Rebuild** selected, the end-user decides when to initiate rebuild following a rebuild prompt. Unless the SteelVine Manager is actively monitored, the Automatic rebuild should be set up to minimize the possibility of data lose.

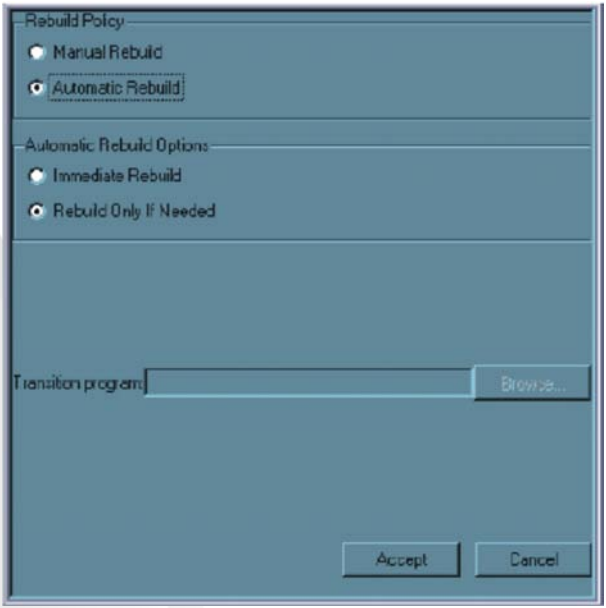
8-3 Configure a rebuild

1. Select Specify Policy from the Edit menu of the Status window



2. Select one of the following policy options:

- The Manual Rebuild radio button required a user to manually initiate a rebuild of the volume.
- The Automatic Rebuild options forces the daemon to initiate the rebuild process automatically and minimize the possibility of data loss.

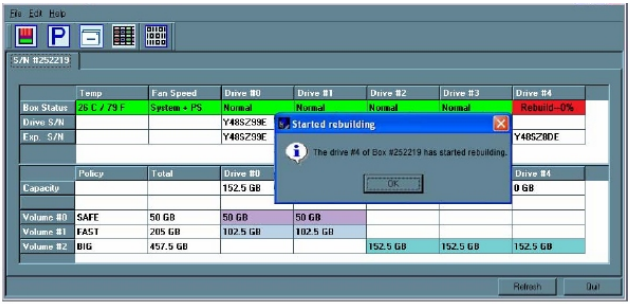


3. If the Automatic Rebuild option is selected, the end-user will have the following additional choices:

- Immediate Rebuild causes the daemon to rebuild immediately following detections of an offline hard disk drive.
- The Rebuild Only If Needed delays the rebuild for a SAFE volume with an offline hard disk drive until the write occurs to the SAFE volume.

4. Click the Accept button to commit the selected options.

The daemon uses the specified rebuild policy to maintain redundancy. The Status window displays a rebuild in progress.

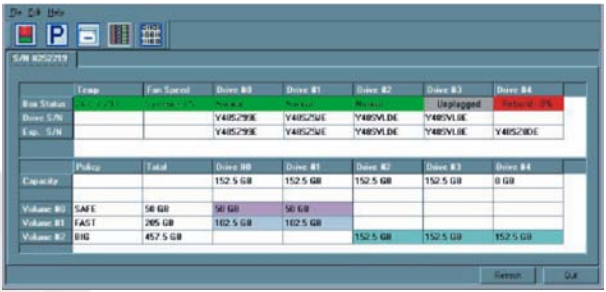


9. Monitoring and Troubleshooting

9-1 Monitor the SteelVine Storage Appliance

Monitor Drive Status

The color of the drivers and the labels in the Status window indicate the status of the drive.



Color Codes and Labels for Driver Status

Color	State	Definition	Resolution
Green	Normal	Drive is active.	
Red	Needs Rebuild	Drive is in a failed state. That is, a write has occurred to a **SAFE** volume while the disk drive was offline.	Replace the failed hard disk drive.
Gray or Red	Unplugged	Drive is offline or unplugged. The background will appear red after a write to the volume.	Verify the disk is securely in the bay. Otherwise, replace as necessary.
Light Blue	New drive	New drive.	
Yellow	Rebuilding	Drive is being rebuilt.	
Purple	Wrong slot	There is a mismatch between the **Serial #** and **Expected Serial #** because a hard disk drive has been installed into the wrong bay.	Install the correct disk drive into the bay.

Monitor Fan Status

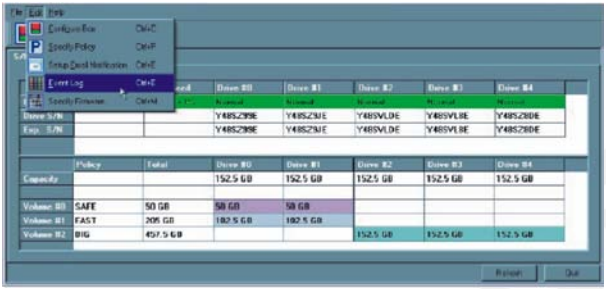
The SteelVine Storage Appliance uses the following colors to indicate fan status:

Color	Value	Definition	Resolution
Green	System + PS	Both system and power supply fans are functioning within limits.	
Red	System	The system fan is not spinning or spinning slower than expected.	Contact point of sale for repair.
Red	PS	The power supply fan is not spinning or spinning slower than expected.	
Red	System + PS	Both system and power supply fans are not spinning or spinning slower than expected.	

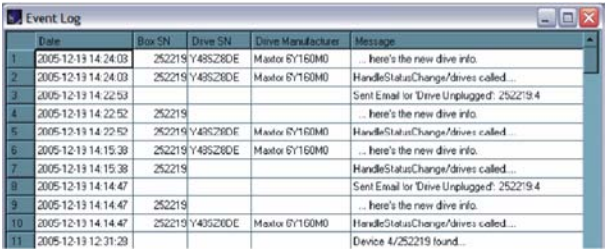
9-2 Review Event Log

Event logs are helpful for troubleshooting and locating a system malfunction.

1. Select Event Log from the Edit menu in the Status window



2. The Event Log screen displays a list of events in a tabular format. The Date column displays the date and time of the event. The Box SN and Drive SN columns display the respective serial numbers for the event. The Drive Manufacturer column displays vendor information. The Message column gives an event description.



	Date	Box SN	Drive SN	Drive Manufacturer	Message
1	2005-12-13 14:24:03	252219	Y48SZ8DE	Maxtor 6Y160M0	... here's the new drive info.
2	2005-12-13 14:24:03	252219	Y48SZ8DE	Maxtor 6Y160M0	HandleStatusChange/drives called...
3	2005-12-13 14:22:53				Sent Email for 'Drive Unplugged': 252219:4
4	2005-12-13 14:22:52	252219			... here's the new drive info.
5	2005-12-13 14:22:52	252219	Y48SZ8DE	Maxtor 6Y160M0	HandleStatusChange/drives called...
6	2005-12-13 14:15:39	252219	Y48SZ8DE	Maxtor 6Y160M0	... here's the new drive info.
7	2005-12-13 14:15:38	252219			HandleStatusChange/drives called...
8	2005-12-13 14:14:47				Sent Email for 'Drive Unplugged': 252219:4
9	2005-12-13 14:14:47	252219			... here's the new drive info.
10	2005-12-13 14:14:47	252219	Y48SZ8DE	Maxtor 6Y160M0	HandleStatusChange/drives called...
11	2005-12-13 12:31:29				Device 4/252219 found...

3. Click Refresh to update the log or click Close to close the log.

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